THE

SQUARE ROOT OF SURDS:

SOLUTION

OF THE

XLVII. PROBLEM

OF

EUCLID,

AND

SQUARE OF THE CIRCLE,

WITH THE TRUE METHOD OF FINDING THE

CIRCUMFERENCE.

DISCOVERED BY

D. S. MERCERON,

BALTIMORE,

1847.

PRINTED BY SAMUEL SANDS, BALTIMORE.

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PRELIMINARY REMARK.

THIS System is founded in Vulgar Fractions, by which, and by which alone, the proper results can be obtained; and any attempt to work by Decimals, either in whole or in part, will prove abortive; for it is so constructed as in the first operation, viz: "the Square of the Root" to exhibit on every occasion, whether the term of the fraction be high or low, the remainder in excess of 1. But the construction of this System is of such an extraordinary character as to exhibit in the course of its several operations, a property in the combination of numbers hitherto unknown, viz: that of PURGING AND RIDDING ITSELF OF THE EXCRESCENCE ENGRAFTED UPON IT, AND COMING OUT IN THE END PERFECTLY TRUE AND WITHOUT ANY REMAINDER WHATEVER; just like old metal, when put into a crucible, after undergoing the operation of fusion, the pure part is collected at the bottom and the dross thrown off.

TABLE

OF THE

SQUARE-ROOT OF SURDS;

By which the Root of any Surd whole No. or of any Surd fraction may be obtained.

SQUARE-ROOT.			Sq. No.	SQUARE-ROOT.			Sq. No.
Integer	Numerator.	Denominator		Integer	Numerator.	Denominator.	
1	11	15	3	34	4829	4899	1224
2	29	35	8	35	5111	5183	1295
3	55	63	15	36	5401	5475	1368
4	89	99	24	37	5699	5775	1443
5	131	143	35	38	6005	6083	1520
6	181	195	48	39	6319	6399	1599
7	239	255	63	40	6641	6723	1680
8	305	323	80	41	6971	7055	1763
9	379	399	99	42	7309	7395	1848
10	461	483	120	43	7655	7743	1935
11	551	575	143	44	8009	8099	2024
12	649	675	168	45	8371	8463	2115
13	755	783	195	46	8741	8835	2208
14	869	899	224	47	9119	9215	2303
15	991	1023	255	48	9505	9603	2400
16	1121	1155	288	49	9899	9999	2499
17	1259	1295	323	50	10301	10403	2600
18	1405	1443	360	51	10711	10815	2703
19	1559	1599	399	52	11129	11235	2808
20	1721	1763	440	53	11555	11663	2915
21	1891	1935	483	54	11989	12099	3024
22	2069	2115	528	55	12431	12543	3135
23	2255	2303	575	56	12881	12995	3248
24	2449	2499	624	57	13339	13455	3363
25	2651	2703	675	58	13805	13923	3480
26	2861	2915	728	59	14279	14399	3599
27	3079	3135	783	60	14761	14883	3720
28	3305	3363	840	61	15251	15375	3843
29	3539	3599	899	62	15749	15875	3968
30	3781	3843	960	63	16255	16383	4095
31	4031	4095	1023	64	16769	16899	4224
32	4289	4355	1088	65	17291	17423	4355
33	4555	4623	1155	66	17821	17955	4488

TABLE—CONTINUED.

SQUARE-ROOT.			Sq. No.	SQUARE-ROOT.			Sq. No.
Integer.	Numerator.	Denominator		Integer.	Numerator.	Denominator.	
67	18359	18495	4623	88	31505	31683	7920
68	18905	19043	4760	89	32219	32399	8099
69	19459	19599	4899	90	32941	33123	8280
70	20021	20163	5040	91	33671	33855	8463
71	20591	20735	5183	92	34409	34595	8648
72	21169	21315	5328	93	35155	35343	8835
73	21755	21903	5475	94	35909	36099	9024
74	22349	22499	5624	95	36671	36863	9215
75	22951	23103	5775	96	37441	37635	9408
76	23561	23715	5928	97	38219	38415	9603
77	24179	24335	6083	98	39005	39203	9800
78	24805	24963	6240	99	39799	39999	9999
79	25439	25599	6309	100	40601	40803	10200
80	26081	26243	6560	1	810	812	203
81	26731	26895	6723				
82	27389	27555	6888	0	99	140	
83	28055	28223	7055		19601	27720	$\frac{1}{2}$
84	28729	28899	7224		3880899	5488420	
85	29411	29583	7395		3650401	6322680	$\frac{1}{3}$
86	30101	30275	7568		3650401	4215120	$\frac{3}{4}$
87	30799	30975	7743				

RULE POR CONTINUING THE TABLE.

To the column of Integers add 1 each time.

To the column of Numerators add 810 for the first, and an additional 8 each time after.

To the column of Denominators add 812, and an additional 8 each time after—and to the column of Square Nos. add 203 and an additional 2 each time after.

RULE

For Extracting the Roots of Surds.

1st—*By Division.*

Select from the Table any Surd which when divided by a square number or a series of square numbers will give the required No. Then divide the Root of the No. so selected by the Root of the Square No. by which it has been divided and the quotient will be the Root of the required Surd.

EXAMPLE.

Required to find the Roots of the Surds,

72—18—4½—32—8—2 and ½.

Select the Surd 288 the Root of which is 16—1121—1155.

4)288	2)16	1121	1155
			2
4)72	2)8	"	2310
			2
4)18	2)4	"	4620
			2
4½	2	"	9240

AGAIN:

9)288	3)16	1121	1155
4)32	2)5	2276	3465
4)8	2)2	5741	6930
4)2	2)1	"	13860
½	0	19601	27720

2d—*By Multiplication.*

Select from the table any Surd which when multiplied by a square number will give the one required; then multiply the Root of the selected number by the Root of the number by which it is multiplied, and the product will be the Root of the number sought.

EXAMPLE.

The Root of the Surd 7 being found, it is required to find the Root of the Surd 28.

7	2	494	765
		2	
4		988	
		765	
28	5	223	"

But as the value of the remainder 1 which runs through the whole system is by the operation of multiplication *in*creased (contrary to that of division by which it is *de*creased) it is advisable before proceeding to operate by this Rule to reduce the value of the remainder 1, which can be done to infinity by the following operations.

RULE

For Reducing the value of the remainder 1.

1*st Operation.*—Multiply the Numerator by 2, and the Denominator by twice the integer—add the two products together for a common multiplier

—then multiply the Numerator and Denominator by that common multiplier for a new Numerator and Denominator, taking care to subtract 1 from the new Numerator alone.

Example.

Required to reduce the value of the remainder 1 from the Square of the Root of the Surd 8.

Surd 8—Root—2—	—29—	—35	1st term
	2	4	
	58	140	
		58	
	198		
	29	198	*common multiplier.*
		35	
	5742		
Deduct,	1		
New Numerator,	5741	6930	*New Denominator.*

2d—*And all future operations.*—Multiply the 2d or new term, by the common multiplier, from the product of which subtract the 1st term and the remainders will be the 3d term.

Again—Multiply the 3d term by the common multiplier, from the product of which subtract the 2d term, and the remainders will be the 4th term; and so on to infinity.

Example.

2	5741	6930	2d term.
	198	198	
	1136718	1372140	
Subtract	29	35	
	1136689	1372105	3d term.
	198	198	
	225064422	271676790	
Subtract	5741	6930	
	225058681	271669860	4th term.

RULE

For transferring the remainder 1 from the Square of the Numerator (its natural place) to the Square of the Denominator of Roots consisting of simple fractions.

Divide the Denominator by the Square of the fraction, and place the quotient over the Numerator and the result will be the fraction required. The quotient of the Denominator thus becoming the Numerator, and the original Numerator becoming the Denominator.

Example.

$$\tfrac{1}{2}\quad \frac{70}{99-\frac{1}{2})140} = \frac{13860}{19601-\frac{1}{2})27720} = \frac{2744210}{3880899-\frac{1}{2})5488420.}$$

1st Term. 2d Term. 3d Term.

$$\tfrac{1}{3}\quad \frac{2107560}{3650401-\frac{1}{3})6322680.}$$

$$\tfrac{3}{4}\quad \frac{3161340}{3650401-\frac{3}{4})4215120}$$

				Proof.
The square of		2744210	=	7530688524100
"	$\frac{1}{2}$	3880899	=	15061377048201
"		5488420	=	30122754096400

Note.—In squaring the hypothenuse of the Right-angled Triangle, the remainder 1 from the facility afforded as above of transferring it from plus to minus et vice versa, ought to be expunged, and the 0 substituted in its place; for when the 1 is so transferred the deficit is exactly the same as the former excess; and if both terms are operated the one neutralizes the other.

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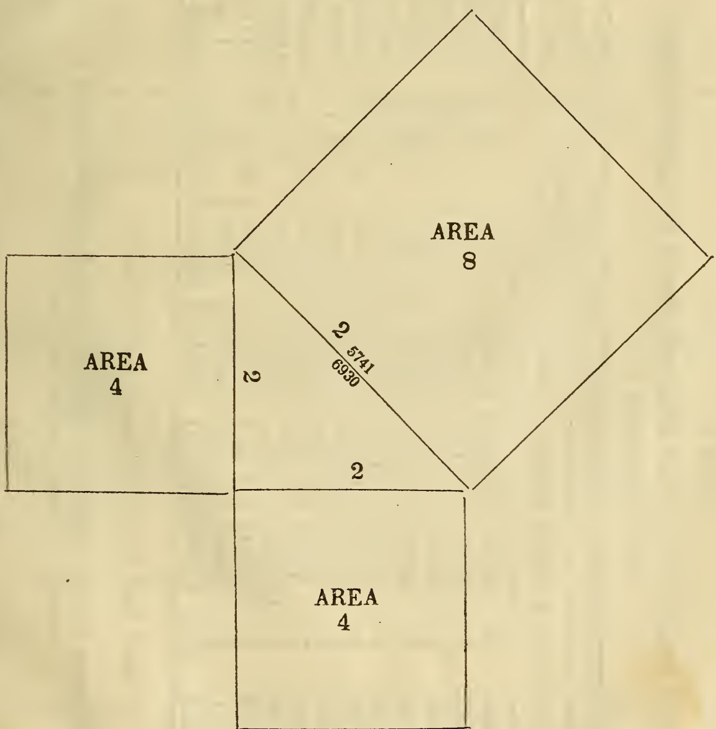
Viz :—That the Square of the hypothenuse of a Right-angled Triangle is exactly equal to the squares of the other two sides united.



NOTE 1.—The hypothenuse of the Right-angled Triangle, and the chord of the arc of 90° of a circle are one and the same.

SQUARE OF THE CIRCLE.

RULE

For Squaring the Circle.

Multiply the chord of the arc of 90° by 5, and divide the product by 4, and the quotient will be the circular Square-Root, which, when multiplied will give the square area of the Circle.

EXAMPLE ON A DIAMETER OF 12.

Chord of the Arc of 90° is,	8 — 2663428 —	5488420		
Multiplied by 5 =	42 — 2340300 —	"		
Divided by 4 =	10 — 3329285 —	"		
The square of which is	112½	225	=	
Excess created by the remainder 1,	30122754096400			
	1			
	133878907095			

TABLE

Of the Square of the Circle of the first 12 Diameters, formed by Multiplication of that of Diameter 1.

Diam'r	Chord of 90°. Denom'r.	Chord of 90°. 27720	Circular Square Root Denom.	Circular Square Root 110880	Circular Area. Denom.		Circular Area. 110880	Excess created by remainder 1. Sq. of Denominator 12294374400 (Excess proportioned to Denominator and to the square of Diameter.)	(The square of every No. is here exhibited.)	Circumference. Denom.		Circumference. 110880
1	0	19601	0	98005	0	($\frac{25}{32}$)	86625	25		3	($\frac{1}{8}$)	13860
2	1	11482	1	85130	3	($\frac{1}{8}$)	13860	100	1	6	($\frac{1}{4}$)	27720
3	2	3363	2	72255	7	($\frac{1}{32}$)	3465	225		9	($\frac{3}{8}$)	41580
4	2	22964	3	59380	12	($\frac{1}{2}$)	55440	400	4	12	($\frac{1}{2}$)	55440
5	3	14845	4	46505	19	($\frac{17}{32}$)	58905	625		15	($\frac{5}{8}$)	69300
6	4	6726	5	33630	28	($\frac{1}{8}$)	13860	900	9	18	($\frac{3}{4}$)	83160
7	4	26327	6	20755	38	($\frac{9}{32}$)	31185	1225		21	($\frac{7}{8}$)	97020
8	5	18208	7	7880	50	($_0$)	00000	1600	16	25	($_0$)	00000
9	6	10089	7	105885	63	($\frac{9}{32}$)	31185	2025		28	($\frac{1}{8}$)	13860
10	7	1970	8	93010	78	($\frac{1}{8}$)	13860	2500	25	31	($\frac{1}{4}$)	27720
11	7	21571	9	80135	94	($\frac{17}{32}$)	58905	3025		34	($\frac{3}{8}$)	41580
12	8	13452	10	67260	112	($\frac{1}{2}$)	55440	3600	36	37	($\frac{1}{2}$)	55440

A Short Rule for finding the Area of a Circle.

Multiply the square of the Diameter by 25, and divide the product by 32 and the quotient will be the area.

RULE

For finding the Circumference of the Circle.

Multiply the circular area of the diameter 1 by 4; then multiply the product by each diameter for its circumference.

EXAMPLE.

Denom.	110880
Circular Area of 1, as per table below,	86625
	4
Circumference of 1 =	3.13860
	12
" 12 =	37.55440

NOTE 1.—The chord of the Arc of 90° is composed of the circumference and diameter, united and blended in one straight line in true and equal proportions, and is therefore, the only true principle upon which the Circle can be squared, or the circnmference found; and every other segment of the Circle is inaccurate as containing undue proportions.

2.—The multiplier and divisor 5 and 4 seem to have been designed by the Great Mathematician of the Universe for squaring the Circle by, because they leave no remainder. The excess which appears being created by the universal 1 upon which the whole fabric is built, and which is essential to the different operations, but which is ultimately thrown off and rejected as valueless.

OBSERVATIONS.

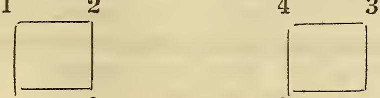
1. The foregoing Table of the Square of the Circle is formed from the 2d term of the Root $\frac{1}{2}$, and the previous example taken from the 3d term, in order to show how materially the excess created by the remainder 1 is reduced by only one remove: the Table giving on the diameter 12 an excess of $\frac{3600}{12294374400} = \frac{1}{3415104}$ and the example giving on the same diameter an excess of only $\frac{225}{30122754096400} = \frac{1}{133878907095}$

2. This system is built not only mathematically but geometrically on the SQUARE, having 1 for its base or corner stone, as may be perceived by a glance at the

KEY

Of the Square Root of Surds, the foundation of the system.

1 2 4 3



1st. Numerator 11 8 8 15 1st Denominat.

But the Great architect of the Universe who formed the system, and who has no need of any base or foundation whereon to rest His superstructures,

has, after forming this system, cast away and rejected the corner stone as being no longer necessary to support the fabric—just as the human architect finds it necessary in the construction of an arch to build it on a frame, but which, when completed, is not only useless but an obstruction.

3. The great obstacle which has hitherto prevented mathematicians from discovering this system, is the universal practice adopted by them, in making use of Decimals instead of Vulgar fractions, for the decimal is a fraction of an EVEN number, whereas this system is entirely composed of ODD numbers, both numerator and denominator, as a glance at the Table of Roots will show.

4 As a proof of the superiority of vulgar fractions over decimals, it is only necessary to produce the following illustration: Take, for instance, the Root of $\frac{1}{2}$, which is 3880899—5488420; convert it into a decimal having the same number of figures as the vulgar fractions, viz: 7; the decimal will then be .7071067. Now the vulgar fraction when squared produces $\frac{15061377048201}{30122754096400}$ giving an excess of only $\frac{1}{30122754096400}$ and the Decimal when squared produces .49999988518489, leaving a deficiency of .00000011481511, equal to $\frac{1}{8709655}$ an enormous difference, and yet both produced from the same fraction.

5 What is very remarkable and helps to shew the perfection of this system is the manner in which the excess created by the remainder 1, is in the final operation of squaring the circle separated and distinguished from the TRUE result, (which leaves no remainder whatever) so that it can never be mistaken; for it is as distinctly marked as the scum thrown up in a cauldron of boiling liquid and collected on one side.

6. Another proof of the perfection of this system is evinced in the extraction of the Root of the same Surd from different parts of the Table, (which often occurs) for altho' each Root is different in its numbers, yet their values are all equal (except as to that of the rem. 1) and lead to one result: indeed the whole system is throughout so dove-tailed and interwoven that it forms a perfect whole. As an example of which, it is only necessary to extract the Root of $\frac{1}{2}$ from the Roots of the Surds 8—288 and 9800.

4) 8	2) 2	29	35
4) 2	2) 1		70
$\frac{1}{2}$	0	99	140
288	16	1121	1155

This example is shown before, where the Root of

$\frac{1}{2}$ is 0 19601 27720

100)9800	10)98	39005	39203
49)98	7)9	352629	392030
4)2	2)1	1136689	2744210
$\frac{1}{2}$	0	3880899	5488420

7. A remarkable feature of this system, and which helps to shew its perfection, is exhibited in the Table of Roots where the 1st Denominator becomes the 3d square No., the 2d Denominator becomes the 5th square No. the 3d Denominator becomes the 7th square No., and so on throughout; the square No. outstripping the Denominator in the ratio of 2 to 1. It is also worthy of remark, that the *last figure* of each No. both of the Numerator and Denominator is repeated in a regular series of 5 each, consisting of 3 figures, viz: 1—5—9 for the Numerator, and 3—5—9 for the Denominator, the 1 and 9 being twice used in the Numerator, and the 3 aud 5 twice in the Denominator, but neither of them ever employing the 7 which together with *all* the *even* figures are carefully excluded.

8. The whole system of squaring the circle and finding the value of its circumference may be comprized in these few words: The Root of $\frac{1}{2}$ determines the value of the Chord of 90°—the Chord of 90° producces the circular square Root—the circular square Root produces the area and the area gives the value of the circumference, thus working its way from the centre to the circumference. The remainder 1, which may be regarded as the centre, may be traced from the Root of the Surd, where it originates, through each operation until it arrives at the area, which is circumscribed by the circumference, where it is finally purged and cast off, but which is as necessary in the different operations as the leaven to the bread and the lees to the wine.

9. In viewing the result obtained by this system, and comparing it with what has been hitherto laid down in all mathematical works as the contents of the Circle, a very considerable difference is manifested, amounting in a circular foot to half a square inch and a fraction. This excess over the true quantity arises from several causes: the first and principal of which has been the want of the Surd Root, whereby mathematicians have been compelled to work all round the Circumference instead of beginning from the centre: the next cause is, that from the same want of the Surd Root, the true circumference has never been known, and they have therefore worked in the dark as far as that knowledge was wanting, the circumference being the last thing obtained; thus beginning at the roof instead of the foundation: the next cause is that in working round the circumference they have employed segments of less than 90°, all of which contain a greater proportion of the circumference than of the diameter, which has consequently swelled the area beyond its true quantity and this excess is *in*creased in proportion as the segment is *de*creased and vice versa: Another cause is to be found in the use of decimals instead of vulgar fractions, from the fact that a decimal, as shewn in the body of this work, leaves a much greater remainder when squared than the vulgar fraction; for being the fraction of an even number, it can never be made to approximate so closely as an odd one allows.

DANIEL S. MERCERON.

Baltimore, 17*th January*, 1848.